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REPORT

JUNE 2018

TOWN OF
Grafton
MASSACHUSETTS

New DPW Facility
Application for Site Plan Review and
Special Permit

EARTHWORK REPORT



Earthwork Summary

The Town of Grafton is proposing the construction of a new Department of Public Works (DPW) facility, located at 48 Old Westboro Road. This summary describes the process for how the volume of earth material, to be removed or delivered to the site, was determined. The earthwork analysis focused on estimating volumes of four different materials including class B soil, top soil, structural material, and bedrock.

TOPSOIL

To start the earthwork process, the top 1.25 feet of soil will be stripped from within the limits of grading. The proposed limit of grading for Grafton's proposed DPW facility is approximately 277,433 square feet and at a depth of 1.25 feet, will generate approximately 12,844 CY of topsoil. Topsoil generated from the site can only be re-used in proposed grassed areas. The volume of proposed topsoil needed for the site is approximately 5,215 CY. This results in a surplus of 7,629 CY of topsoil that will either be removed from the site and potentially sold by the Contractor and/or re-used on site in areas where thickened topsoil layers can be placed. See attached plan C6.03, which illustrates the areas, depths, and volumes of topsoil that will be required for the proposed site.

CLASS B SOILS

The on-site Class B soils are inorganic and contain high levels of fines, which make them unsuitable to be used beneath the building. They are proposed to be used in green areas and within three feet of finish grades in paved areas. To estimate the volume of class B material to be generated on site, AutoCAD Civil 3D was used to compare the bottom of top soil layer to the bottom of structural fill layer as illustrated on C6.01. The area shown in color on C6.01 indicates where Class B material will be generated on site. From this calculation, approximately 21,231 CY of class B material will be generated. Included in this calculation is an existing stockpile left over from the Grafton high school project. Soil samples taken from the top, middle, and bottom of the stockpile were analyzed for organic content, to determine if the stockpile qualified as class B material. The results from the samples are summarized in the table below. These results indicate that the existing stockpile contains organic material ranging from 3.3% to 5%. The organic content of the existing stockpile is too high for this material to be considered class B Material, therefore, it was determined to have the stockpile removed from the site prior to construction. To account for the pile being removed from the site, the volume of the stockpile was subtracted from the Class B soil generated on site. After removing the volume of the existing stockpile, it is estimated that there will be 6,287 CY of class B soils available to be reused on site. The total volume of class B material required for the site is approximately 19,910 CY, to be used in grassed areas (15,621 CY) and within three feet of finished grade in paved areas (4,289 CY). Plan C6.02 illustrates the areas on the site where class B materials will be required. The balance of Class B material on the site is -13,623 CY, which indicates that approximately 13,623 CY of class B material will need to be imported to the site.

| Results of Organic Content Determination - Grafton DPW Facility | | | |
|---|--------------------|----------------------------------|------------------------|
| <i>Exploration</i> | <i>Sample Type</i> | <i>Sample ID / Depth</i> | <i>Organic Content</i> |
| Existing Stockpile | Composite | Top 1/3 of Pile (Top 5' ±) | 3.3% |
| Existing Stockpile | Composite | Middle 1/3 of Pile (Middle 5' ±) | 4.0% |
| Existing Stockpile | Composite | Bottom 1/3 of Pile (Bottom 5' ±) | 5.0% |

STRUCTURAL MATERIAL

Structural material consists of concrete, asphalt, gravel borrow, and crushed stone. The concrete is used for Building slabs, foundations, and miscellaneous concrete pads. Gravel borrow, or crushed stone will be placed directly below concrete and asphalt. To calculate the volume of structural material required for the proposed site the area of asphalt and buildings were multiplied by the depth of structural fill required. It is estimated that 9,600 CY of structural material will need to be imported to the site. A summary of this calculation can be found in the attached spreadsheet.

BED-ROCK

Bedrock elevation data was generated with test pits and borings performed at locations shown on the existing conditions plan. AutoCAD Civil 3D was used to create a linear interpolation between the data points to generate a bed-rock surface. This bedrock surface was then compared with the proposed foundation plan to estimate the volume of rock to be removed during construction. As illustrated on C6.04, 109 CY of bedrock is expected to be removed for the portion of the building included in the base bid. If the bid alternate for the vehicle storage garage is selected, it is estimated that 116 CY of bedrock will need to be removed.

SUMMARY

It is estimated that the project will require approximately 9,600 CY of structural material to be imported to the site, 13,650 CY of class B material imported to the site, 116 CY of bedrock removed from the site, and up to 7,700 CY of topsoil removed from the site. In total, there will be approximately 23,250 CY of materials being brought to the site and up to 7,816 CY of materials being removed from the site during the construction of the facility. Attached is an earthwork summary spreadsheet summarizing the total earthwork volumes described above and on the site plans.

Grafton DPW Facility Earthwork Summary

6/22/2018

Imported Structural Materials

| Item | Area (sqft) | Thickness (in) | Volume (CY) |
|--|-------------|----------------|-------------|
| Building Slab & Subbase (8" conc + 12" gravel borrow) | 29,945 | 20 | 1,848 |
| Building Slab & Subbase (6" conc + 12" gravel borrow) | 3,793 | 18 | 211 |
| Fuel Island, Tight Tank cover, Generator, Other Pads | 1,513 | 24 | 112 |
| Parking and Roadway Pavement & Subbase (5" Asphalt + 12" gravel borrow = 17") | 99,100 | 17 | 5,200 |
| Additional Gravel borrow beneath pavement (in areas where 17"< Fill < 36" (Civil 3D) | | | 2,218 |

TOTAL 9,588 CY Structural Material Imported

Class B Soil Volumes

| | | |
|--|----------|--|
| Class B soil generated (Civil 3D) | 21,231 | CY (Includes 17,000 CY stock pile, to be reomoved by town prior to construction) |
| Class B soil from Stock pile adjustment | 14,944 | CY (17,000 CY total initial stockpile minus topsoil layer) |
| Total Class B soil Available on site to Re-use on Site | 6,287 | CY |
| Class B soil required within 3 ft of finish grade (paved areas) (civil 3D) | 4,289 | CY |
| Class B soil required (Grass areas) (civil 3D) | 15,621 | CY |
| Balance of Class B back Fill | (13,623) | We have a shortage of class B back fill and will need to import 13,623 CY |

Top Soil Volumes

| | | |
|-------------------------------------|-----------|--|
| Clearing depth (ft) | 1.25 | ft |
| Area of Grading (sqft) | 277,433 | (approx., 6.369 AC) |
| Volume of top soil generated | 12,844.12 | CY |
| Volume of top soil needed (1' deep) | 5,215 | CY |
| Balance of Top soil | 7,629 | CY of top soil remaining (stockpile removed from site) |

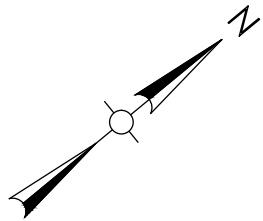
Rock Removal

| | | |
|---------------------------------------|-----|---|
| Base Bid Rock Removal (Civil 3D) | 109 | CY Total Bedrock Removed if Base Bid is selected |
| Bid Alternate Rock Removal (Civil 3D) | 116 | CY Total bedrock Removed if Bid Alternate is selected |

Summary:
Project requires the import of approximately 9600 CY of structural material
Project requires the import of approximately 13,650 CY of Class B material
Project requires the removal of approximately 116 CY of Bedrock
Project requires the removal of approx. 7,700 CY of top soil material

Notes:

- 1. Surplus topsoil generated could be potentially sold to contractor(s).
- 2. Additional Class B backfill may be generated on site due to Mass. Pike fill, estimates to be completed.
- 3. Assuming 1.25' of topsoil to be stripped may be conservative, final estimates to be determined.

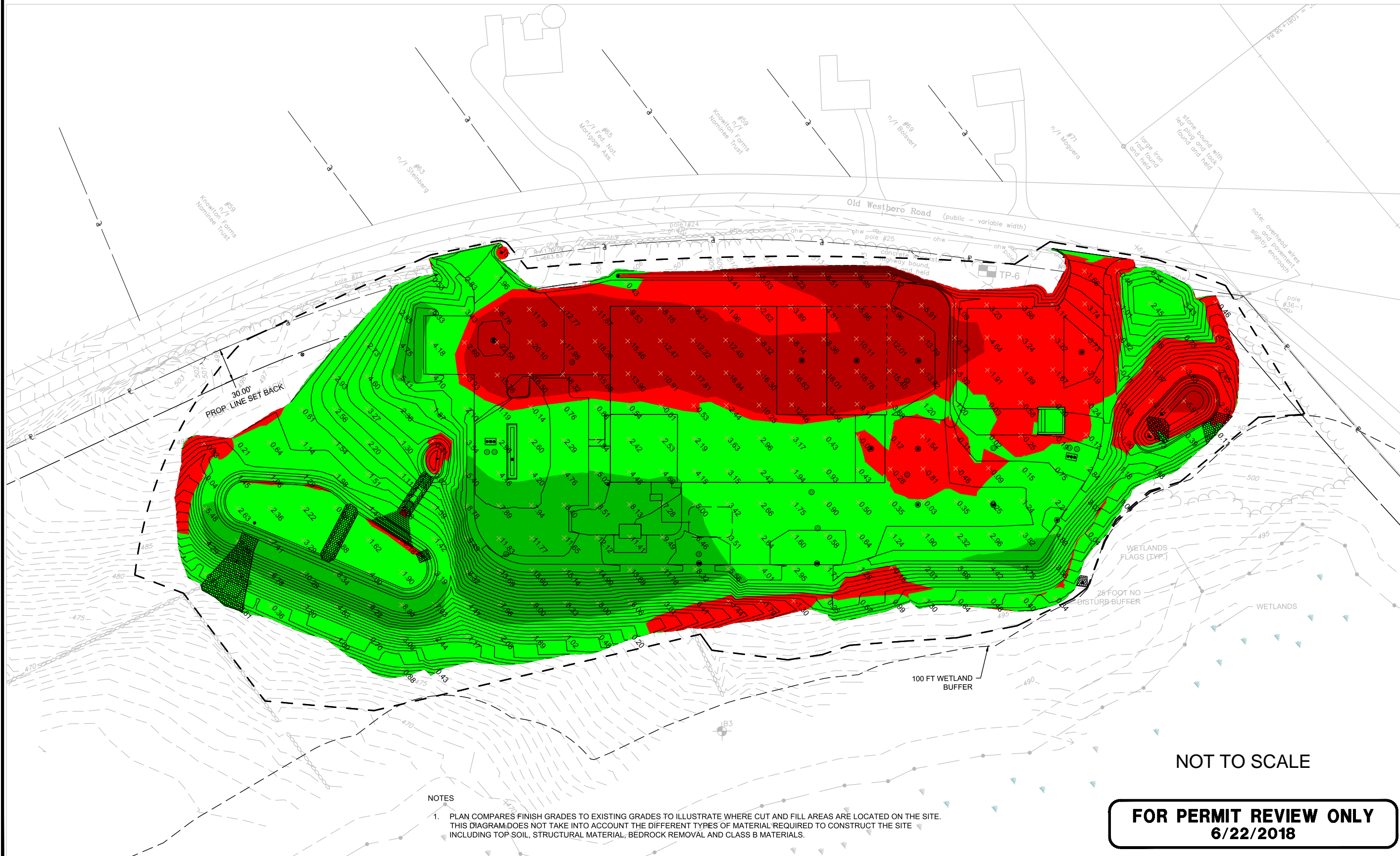


AREA OF CUT GREATER THAN 5 FEET

AREAS OF CUT LESS THAN 5 FT

AREAS OF FILL LESS THAN 5 FEET

AREAS OF FILL GREATER THEN 5 FEET



- NOTES
1. PLAN COMPARES FINISH GRADES TO EXISTING GRADES TO ILLUSTRATE WHERE CUT AND FILL AREAS ARE LOCATED ON THE SITE. THIS DIAGRAM DOES NOT TAKE INTO ACCOUNT THE DIFFERENT TYPES OF MATERIAL REQUIRED TO CONSTRUCT THE SITE INCLUDING TOP SOIL, STRUCTURAL MATERIAL, BEDROCK REMOVAL AND CLASS B MATERIALS.

NOT TO SCALE

FOR PERMIT REVIEW ONLY
6/22/2018

Project:
TOWN OF GRAFTON

DEPARTMENT OF PUBLIC WORKS

48 OLD WESTBORO ROAD
GRAFTON, MA 01519

OWNER: TOWN OF GRAFTON
ASSESSORS MAP: 48
LOT: 12

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Peabody, MA 01960
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Consultants:

Revisions:

| No. | Date | Description |
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Seal:

Issued For:

PERMITTING

Scale: AS NOTED

Date: JUNE 22, 2018

Drawn By: TJC

Reviewed By: JIP

Approved By: JRF

W&S Project No: 2180199

W&S File No: -

Drawing Title:

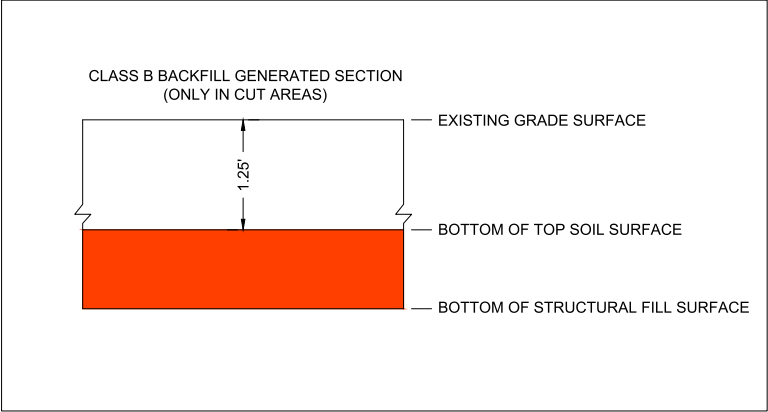
EARTH WORK
PLAN
FINISH GRADE
TO EXISTING
GRADE

Sheet Number:

C6.00



CLASS B GENERATED (INCLUDING EXISTING STOCK PILE) = 21,231 CY
VOLUME OF STOCK PILE = 17,000 CY
VOLUME OF STOCK PILE MINUS 1.25' TOP SPOIL LAYER = 14,994 CY
CLASS B GENERATED (STOCK PILE REMOVED) = 6,287 CY



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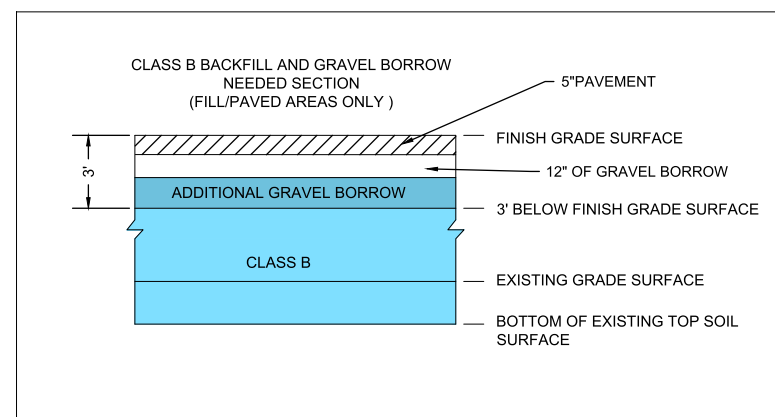
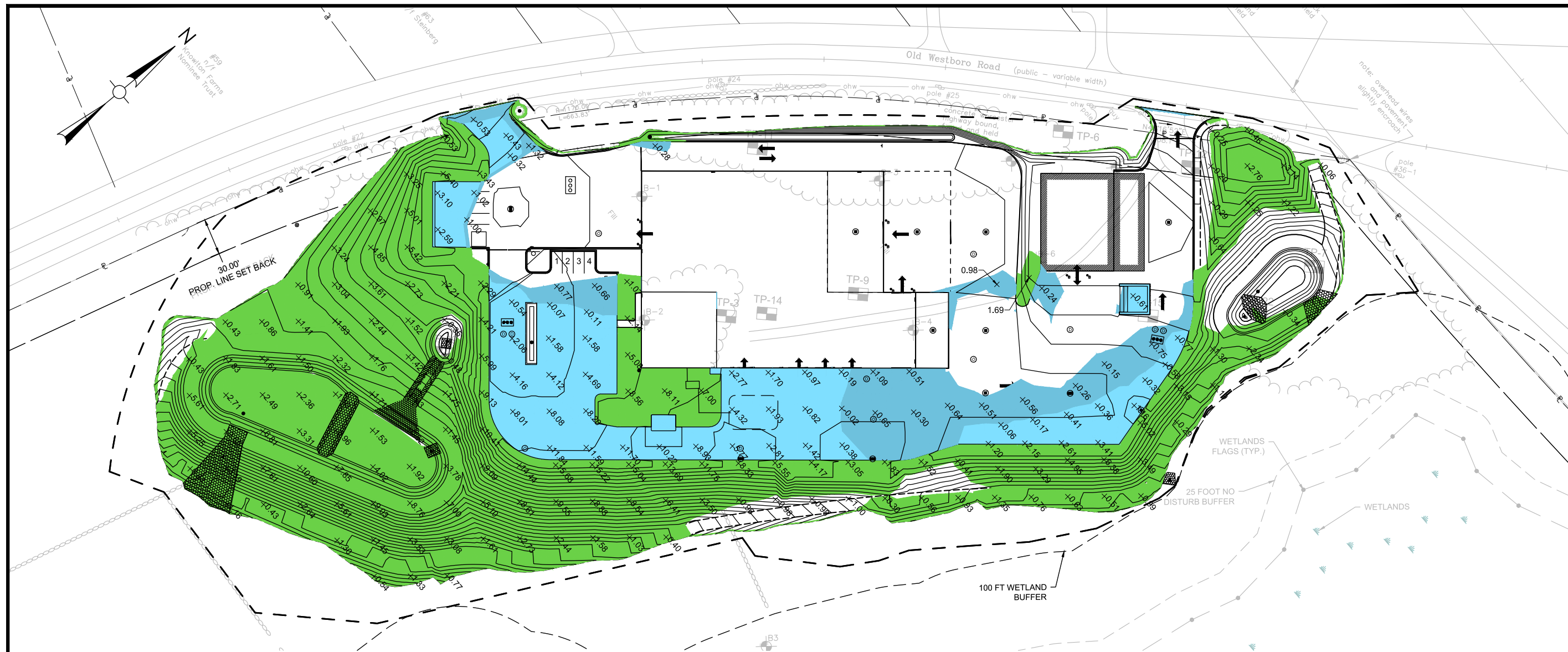
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Drawing Title:

EARTHWORK
CLASS B
GENERATED

Sheet Number:

C6.01

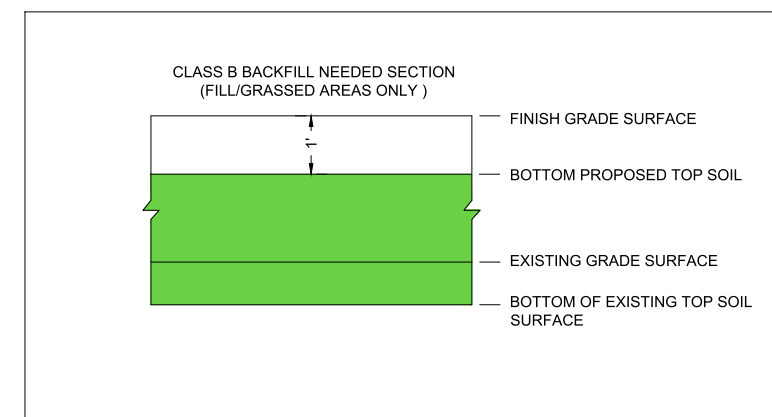


CLASS B REQUIRED IN PAVED AREAS = 4,289 CY

CLASS B REQUIRED IN GRASSED AREAS = 15,621 CY

TOTAL CLASS B = 19,910 CY

ADDITIONAL GRAVEL BORROW NEEDED IN PAVED AREAS = 2,218 CY



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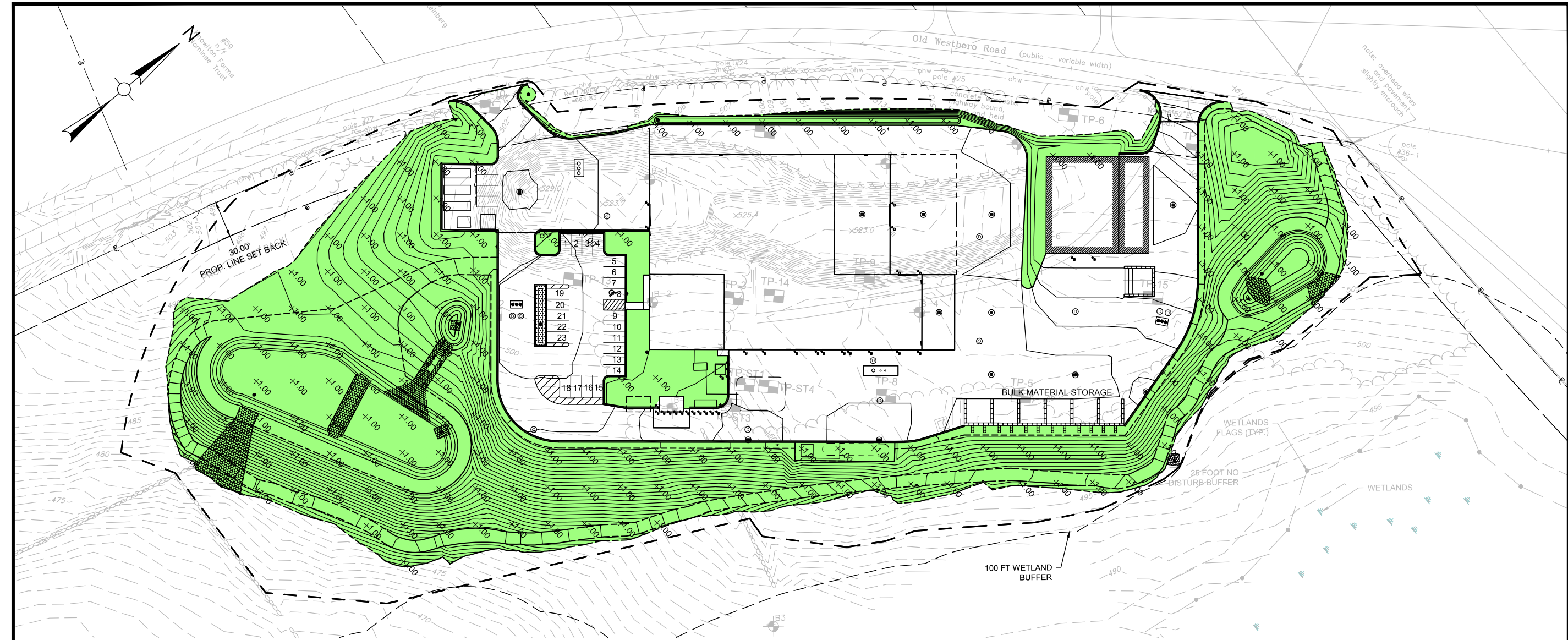
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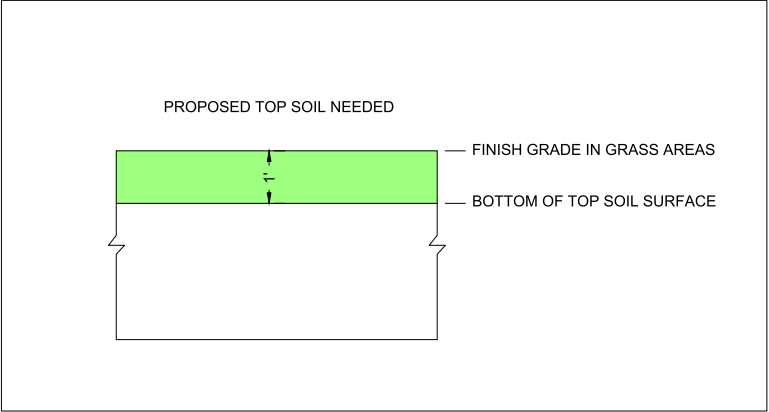
EARTHWORK
CLASS B
AND
GRAVEL BORROW
NEEDED

Sheet Number:

C6.02



VOLUME OF TOP SOIL NEEDED = 5,215 CY



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Drawing Title:

**EARTHWORK
TOP SOIL**

Sheet Number:

C6.03

